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# **2.8 inch SPI module**

## **JC2432S028**



## Table of contents

<b>Table of contents</b>	1
<b>Product description</b>	2
<b>Product Features</b>	2
<b>Product Parameters</b>	3
<b>Interface Description</b>	4
<b>Hardware Configuration</b>	7
<b>working principle</b>	7



## Product description

The LCD module uses a 4-wire SPI communication method with a driver IC of ILI9341 with a resolution of 240x320 and a touch function (optional). The module includes an LCD display, backlight control circuitry, and touch screen control circuitry

## Product Features

- 2.4-inch color screen, support 16-bit 65K color display, display rich colors
- 240X320 resolution with optional touch function
- Using the SPI serial bus, it only takes a few IOs to illuminate the display
- Easy to expand the experiment with SD card slot
- Provide a rich sample program
- Military-grade process standards, long
- Provide underlying driver technical support

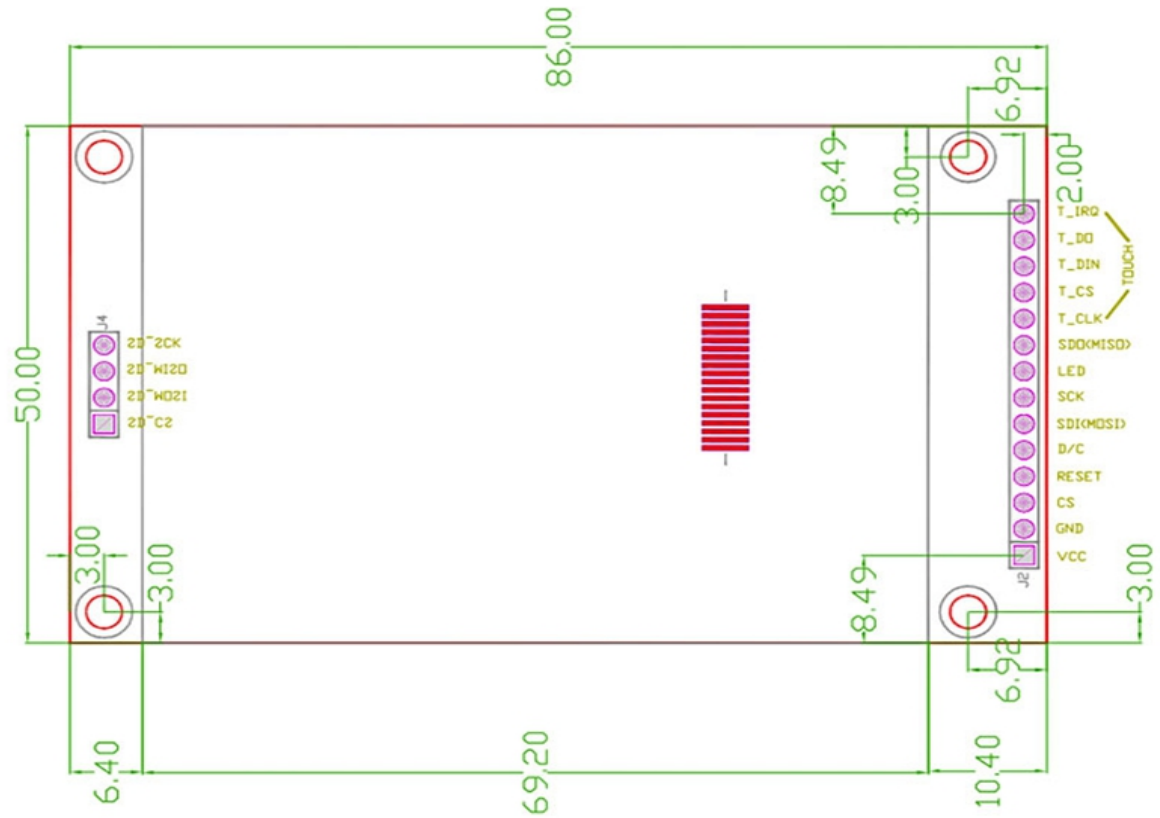


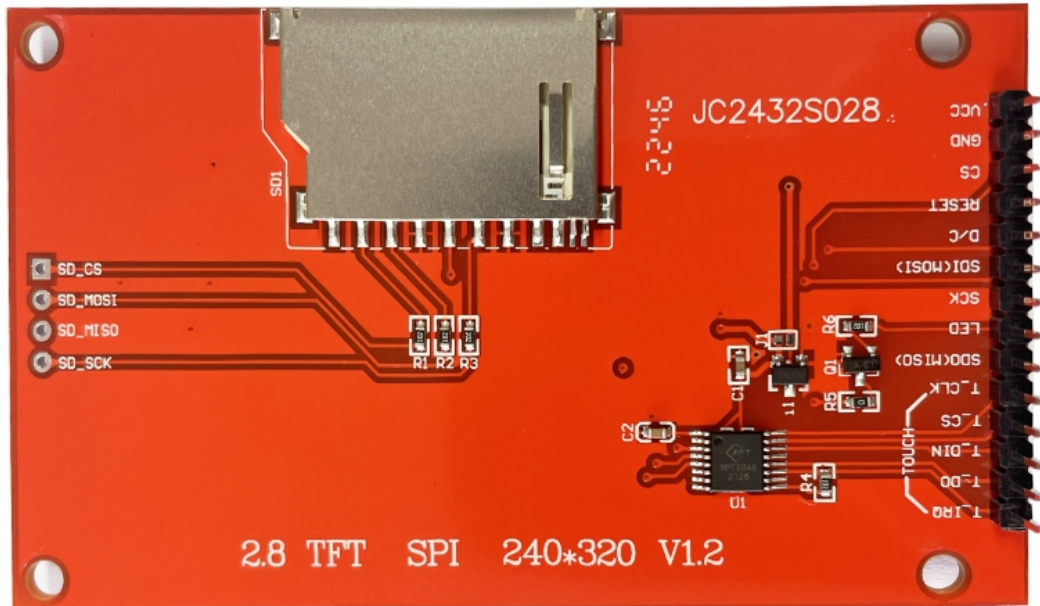
## Product Parameters

Name	Description
Display Color	RGB 65K color
SKU	have touch screen: JC2432S028R
	Without touch screen: JC2432S028N
Screen Size	2.8(inch)
Type	TFT
Driver IC	ILI9341
Resolution	320*240(Pixel)
Module Interface	4-wire SPI interface
Active Area	43.2x57.6 (mm)
Module PCB Size	50.0x86.0 (mm)
Angle of view	>60°
Operating Temperature	-20℃~70℃
Storage Temperature	-30℃~80℃
Operating Voltage	3.3V / 5V
Power Consumption	About 90mA
Product Weight	About 25(g)



## Interface Description







Number	ModulePin	Pin Description
1	VCC	LCD power supply is positive (3.3V~5V)
2	GND	LCD Power ground
3	CS	LCD selection control signal
4	RESET	LCD reset control signal
5	DC/RS	LCD register / data selection control signal
6	SDI(MOSI)	LCD SPI bus write data signal
7	SCK	LCD SPI bus clock signal
8	LED	LCD backlight control signal (high level lighting, if you do not need control, please connect 3.3V)
9	SDO(MISO)	LCD SPI bus read data signal (can not be connected if not needed)
The following is the touch screen signal line wiring, if you do not need to touch function or the module itself does not have touch function, you can not connect them		
10	T_CLK	Touch screen SPI bus clock pin
11	T_CS	Touch screen chip select control pin
12	T_DIN	Touch screen SPI bus write data pin
13	T_DO	Touch screen SPI bus read data pin
14	T_IRQ	Touch screen interrupt detection pin



## Hardware Configuration

The LCD module hardware circuit includes three parts: an LCD display control circuit, a touch screen control circuit, and a backlight control circuit. The LCD display control circuit is used to control the pins of the LCD, including control pins and data transfer pins. The touch screen control circuit can control touch screen touch corresponding and touch coordinate reading (touch screen optional). The backlight control circuit is used to control the backlight to be on and off. Of course, if the backlight is not required to be controlled, the backlight control pin can be directly connected to the 3.3V power supply without using the circuit.

## working principle

1. Introduction to ILI9341 Controller The ILI9341 controller supports a maximum resolution of 240\*320 and a 172800-byte GRAM. It also supports 8-bit, 9-bit, 16-bit, and 18-bit parallel port data buses. It also supports 3-wire and 4-wire SPI serial ports. Since parallel control requires a large number of IO ports, the most common one is SPI serial port control. The ILI9341 also supports 65K, 262K RGB color display, display color is very rich, while supporting rotating display and scroll display and video playback, display in a variety of ways. The ILI9341 controller uses 16bit (RGB565) to control a pixel display, so it can display up to 65K colors per pixel. The pixel address setting is performed

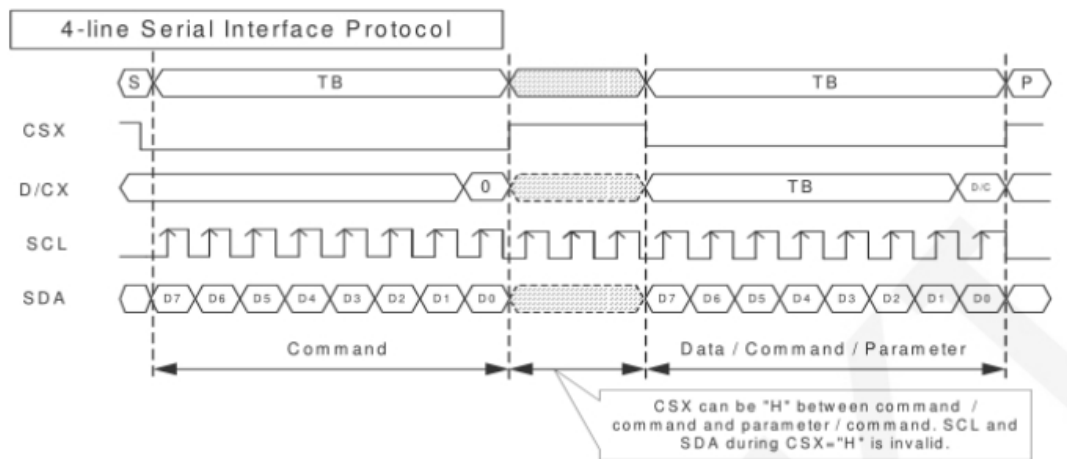




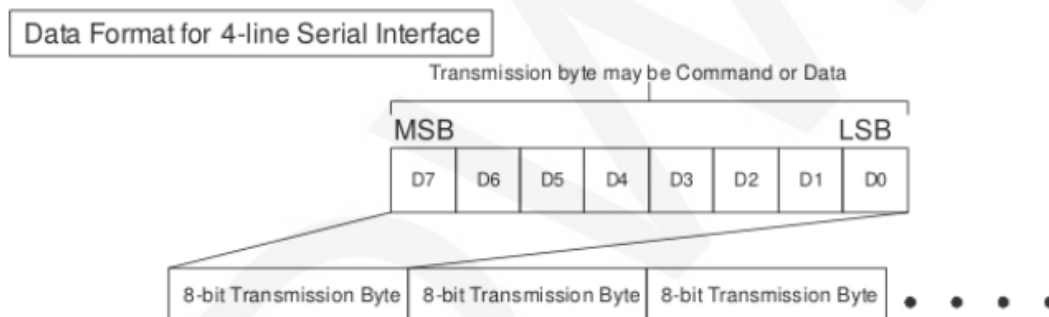
in the order of rows and columns, and the incrementing and decreasing direction is determined by the scanning mode. The ILI9341 display method is performed by setting the address and then setting the color value.

## 2. Introduction to SPI communication protocol

The 4-wire SPI bus write mode timing is shown in the following figure:



CSX is a slave chip select, and the chip is enabled only when CSX is low. D/CX is the data/command control pin of the chip. When DCX is low, the command is written. When it is high, the data is written. SCL is the SPI bus clock, and each rising edge transmits 1 bit of data; SDA is the data transmitted by SPI, and it transmits 8-bit data at a time. The data format is as shown below:





The high position is in front and transmitted first. For SPI communication, the data has a transmission timing, that is, a combination of clock phase (CPHA) and clock polarity (CPOL): The CPOL level determines the idle state level of the serial synchronous clock,  $CPOL = 0$ , which is low. CPOL does not have a lot of impact on the transport protocol; The level of CPHA determines whether the serial synchronous clock is acquired on the first clock transition edge or the second clock transition edge. When  $CPHL = 0$ , data acquisition is performed on the first edge of the transition; The combination of the two becomes the four SPI communication methods. SPI0 is usually used in China, that is,  $CPHL = 0$ ,  $CPOL = 0$ .